Claims

What is claimed is:

1. A method for determining whether a physical variable in a computer system is changing, wherein values of the physical variable are reported as quantized values, the method comprising:

    updating a current frequency of occurrences of a particular quantized value in response to an occurrence of the particular quantized value;

    determining whether the current frequency is statistically different than a reference mean frequency of the particular quantized value; and

    selectively issuing an indication that the physical variable is changing dependent on the determining.

2. The method of claim 1, further comprising:

    determining the reference mean frequency, comprising:

        prior to updating the current frequency:

            sampling a plurality of quantized values,

            calculating a mean frequency of occurrences of the particular quantized value in the plurality of quantized values, and

            storing the mean frequency as the reference mean frequency.

3. The method of claim 1, wherein determining whether the current frequency is statistically different than the reference mean frequency comprises using a Sequential Probability Ratio Test.

4. The method of claim 1, wherein determining whether the current frequency is statistically different than a reference mean frequency comprises:

statistically comparing the current frequency to an alternate mean frequency, wherein the alternate mean frequency is a mean frequency of a distribution of frequencies of the particular quantized value indicative of the signal anomalously changing.

5. The method of claim 1, wherein determining whether the current frequency is statistically different than the reference mean frequency comprises:

calculating a test value, the test value being equal to $SPRT(i-1)+\left[\frac{(x_i-M_0)^2}{2\sigma^2}-\frac{(x_i-M_1)^2}{2\sigma^2}\right]$, wherein $SPRT(i-1)$ represents a previously calculated test value, wherein x_i represents the current frequency, wherein M_0 represents the reference mean frequency, wherein M_1 represents an alternate mean frequency, and wherein σ^2 represents a variance associated with the reference mean frequency.

6. The method of claim 5, wherein the alternate mean frequency is equal to the reference mean frequency ± a predetermined value.

7. The method of claim 6, wherein the predetermined value is a predetermined percentage of the reference mean frequency.

8. The method of claim 5, wherein the alternate mean frequency is dependent on the variance.

9. The method of claim 5, further comprising:

comparing the calculated test value to a constant value, wherein the constant value is determined based on a selected error tolerance.

10. The method of claim 9, further comprising:

calculating the constant value, the constant value being equal to $\ln\left(\frac{\beta}{1-\alpha}\right)$,

wherein α is a first error tolerance value, and wherein β is a second error tolerance value.

11. The method of claim 9, further comprising:

calculating the constant value, the constant value being equal to $\ln\left(\frac{1-\beta}{\alpha}\right)$,

wherein α is a first error tolerance value, and wherein β is a second error tolerance value.

12. The method of claim 1, further comprising:

dependent on selectively issuing the indication, determining an index that represents how significantly the physical variable is changing.

13. A method for determining a change in a signal that is measured by quantization, comprising:

in a first stage:

sampling a first plurality of quantized values, and

updating a frequency of occurrences for each different quantized value in the first plurality of quantized values;

in a second stage:

sampling a second plurality of quantized values,

updating a frequency of occurrences for each different quantized value in the second plurality of quantized values, and

continuously updating and storing a reference mean frequency and variance for each different quantized value in the second plurality of quantized values; and

in a third stage:

sampling a third plurality of quantized values,

determining a current frequency of occurrences of a particular quantized value in response to sampling the particular quantized value in the third plurality of quantized values,

comparing the current frequency to the reference mean frequency of the particular quantized value determined in the second stage, and

selectively indicating that the signal is changing dependent on the comparing.

14. The method of claim 13, wherein comparing the current frequency to the reference mean frequency comprises using a Sequential Probability Ratio Test.

15. The method of claim 13, wherein comparing the current frequency to the reference mean frequency comprises:

calculating a test value, the test value being equal to $SPRT(i-1)+\left[\frac{(x_i-M_0)^2}{2\sigma^2}-\frac{(x_i-M_1)^2}{2\sigma^2}\right]$, wherein $SPRT(i-1)$ represents a previously calculated test value, wherein x_i represents the current frequency, wherein M_0 represents the reference mean frequency, wherein M_1 represents an alternate mean frequency, and wherein σ^2 represents the reference variance.

16. The method of claim 15, wherein the alternate mean frequency is a mean frequency of a distribution of frequencies considered to be indicative of the signal anomalously changing.

17. The method of claim 15, further comprising:

comparing the calculated test value to a value calculated based on a predetermined error tolerance.

18. A computer-readable medium having recorded therein instructions executable by processing, the instructions to:

sample a first plurality of quantized values representing analog values of a physical variable in a computing system;

update a frequency of occurrences for each different quantized value in the first plurality of quantized values;

calculate a reference mean frequency for each different quantized value in the first plurality of quantized values;

sample a second plurality of quantized values representing analog values of the physical variable;

calculate a current frequency of occurrences for each different quantized value in the second plurality of quantized values; and

determine whether the current frequency for at least one different quantized value in the second plurality of quantized values is statistically different than the reference mean frequency of the at least one different quantized value.

19. The computer-readable medium of claim 18, wherein the instructions for the determining comprise instructions to:

calculate a value using a Sequential Probability Ratio Test.

20. A computing system, comprising:

a sensor arranged to monitor a physical variable of the computing system, the sensor further arranged to output quantized values representative of actual values of the physical variable; and

an integrated circuit arranged to process instructions for:

updating a current frequency of occurrences for each different quantized value generated from the sensor,

comparing the current frequency of a particular quantized value to a reference mean frequency of the particular quantized value, and

indicating that the physical variable is changing dependent on the comparing.

21. The computing system of claim 20, wherein the sensor comprises an analog-to-digital converter.

22. The computing system of claim 20, wherein the instructions for comparing are dependent on a Sequential Probability Ratio Test.

23. The computing system of claim 20, wherein the instructions for comparing the current frequency of the particular quantized value to the reference mean frequency of the particular quantized value comprise instructions to:

calculate a test value, the test value being equal to $SPRT(i-1)+\left[\frac{(x_i-M_0)^2}{2\sigma^2}-\frac{(x_i-M_1)^2}{2\sigma^2}\right]$, wherein $SPRT(i-1)$ represents a previously calculated test value, wherein x_i represents the current frequency, wherein M_0 represents the reference mean frequency,

wherein M_1 represents an alternate mean frequency, and wherein σ^2 represents a variance associated with the reference mean frequency.

24. The computing system of claim 20, wherein the computing system is a server.

25. A technique for detecting changes in a signal measured by quantization, comprising:

sampling a first plurality of quantized values of the signal for a first predetermined amount of time;

calculating a frequency of occurrences of at least one different quantized value in the first plurality of quantized values in response to every occurrence of the at least one different quantized value in the first plurality of quantized values;

updating a reference mean frequency of at the least one different quantized value in response to every occurrence of the at least one different quantized value in the first plurality of quantized values;

sampling a second plurality of quantized values;

calculating a current frequency of occurrences of the at least one different quantized value in the second plurality of quantized values in response to an occurrence of the at least one different quantized value in the second plurality of quantized values;

determining whether the current frequency is statistically different than the reference mean frequency; and

selectively issuing an indication that the signal is changing dependent on the determining.

26. The technique of claim 25, further comprising:

sampling a plurality of quantized values for a predetermined amount of time prior to sampling the first plurality of quantized values.

27. The technique of claim 25, wherein sampling the second plurality of quantized values occurs for a second predetermined amount of time.

28. The technique of claim 25, wherein determining whether the current frequency is statistically different than the reference mean frequency is dependent on a sequential test.

29. The technique of claim 28, wherein the sequential test is a Sequential Probability Ratio Test.